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Method in a communication system

FIELD OF THE INVENTION

5   The present invention relates to an optimised RNC
registration for setting up an MBMS-session.

BACKGROUND OF THE INVENTION

In standards there basically three methods described where
MBMS context is built up in RAN.

10   a) Implicit registration of a RNC node to the core network.
This is the implicit (no additional signaling required over
Iu) method where a RNC in it is role of SRNC is registered
in a SGSN whenever a mobile moves (from RRC
Idle/URA_PCH/CELL_PCH) to CELL_FACH/CELL_DCH to set up a PS
15   RAB at MBMS join or in CELL_FACH/CELL_DCH is joining a MBMS
Service.

b) Explicit registration of a RNC node to the core network.
This is the explicit method where a RNC in it is role of
DRNC signals to its default SGSN to be registered for the
20   first joined UE for which it is a DRNC.

c) RA based registration. This is a implicit method where
the RAs are registered for mobiles which has joined the MBMS
service. The RAU procedure implicitly gives the RA for
joined mobiles.

25   The registration information are used by the core network to
distribute the session start message to RNCs where there are

joined mobiles and to set up Iu user plane resources for the MBMS session.

Another important issue is that the session start message triggers paging over UTRAN, the implication of this is that
5   paging load.

So far the stage 2 specification (TS 25.346) specifies that the UE is linked to a MBMS Service context in the SRNC when the mobile is joining the service and is in PMM-CONNECTED or in case the mobile sets up a PS RAB. This may happen at any
10   point in time, before and during sessions. The consequences of this is that a MBMS UE context will be established in the SRNC via the UE linking procedure over Iu, whenever the mobile is joining the service.

It is clear from TS 25.346 that MBMS service context for a
15   session is made available to RAN via individual UE linking over Iu before session start. The SRNC uses the context information for tracking purposes, ptp bearer set up and for paging considerations. It is also responsible for Iur-linking.

20   In the opposite to the Iu-linking procedure, the Iur-linking procedure does not have a clear definition when the DRNC shall be informed of the MBMS UE context from SRNC. The main purpose of Iur-linking is to provide DRNC in its role of CRNC information for decision on ptp/ptm (point-to-
25   point/point-to-multipoint) on cell basis and channel configuration for the MBMS transmission in case of ptm. There are two main possibilities: Early Iur-linking and late Iur-linking, i.e. Iur-linking only at session start

The current specifications (TS 25.346 v2.2.0) allow linking
30   over Iur to be performed at service activation, at session

start and during an ongoing session (a user equipment joins an ongoing session). The early Iur-linking and late Iur-linking are indeed one and the same procedure. The only differs in the context when they are triggered. The early

5   Iur-linking is a complementary procedure, such that late Iur-linking is a mandated procedure and must be implemented in SRNC to support late arrivals of mobiles when session has started. The early Iur-linking is optional features and provides optimisation of signalling load processing at

10   session start.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows an early Iur-linking triggered by Iu-linking.

Figure 2 shows a late Iur-linking by reception of RANAP

15   Start Session.

Figure 3 shows an enhanced Iur-linking with session parameters provided.

20   **DESCRIPTION OF THE INVENTION**

The three methods where MBMS context is built up in RAN as described above are to some extent complementary and in order to reduce frequent explicit registration/de-registration alternate triggering conditions are proposed.

25   The explicit registration which is specified for RRC connected PMM-Connected mobiles, i.e. for RRC states CELL_FACH and CELL_DCH may easily be expanded to include also UEs in URA_PCH and CELL_PCH. This leads to increased number of RNC registrations before MBMS session starts and

in order to reduce explicit registrations only to be performed when a ptm MBMS transmission resource is set up is proposed. With the current scheme the registration is performed equally for both the ptp and ptm decision. The
5   registration with a following ptp decision takes longer time than setting up a ptp bearer without registration, so registration with ptp should be avoided.

This might lead to the following concept:

10   1) Registration when passing a threshold.

         2) Registration based on prediction of number of users
            based on number of Iur-linking during a pre-defined
            time, e.g. frequent number of cell updates, URA
            updates.

15   3) Second threshold may be applied such that it invokes a
            hysterisis.

         4) Less resolution such that passing the threshold for one
            cell shall not lead to ptm decision, due to increased
            probability that neighbouring cell will take some of
20   the traffic and therefore triggering conditions is
            enhanced to involve threshold per cell and number of
            cells the CRNC is controlling.

The two main proposals for UEs in CELL_FACH and CELL_DCH are now discussed below:

25   The Iur-linking procedure is also to be considered as a result of mobility in RAN. When a UE in RRC_CONNECTED mode is moving from the SRNC to another RNC results in Iur-linking. Before session start the Iur-linking procedure is implemented as the RNSAP MBMS Attach Request procedure.

During session it may be incorporated in existing elementary
procedure RL Set Up in case of ptp. In case the target cell
is already configured for ptm, SRNC may either incorporate
Iur linking in the elementary procedure Common Transport

5   Channel Resources procedure or only invoke RNSAP MBMS Attach
Request procedure. The inclusion of elementary procedure for
Iur-linking is not addressed further in this paper.

Early Iur-linking: By reception of MBMS UE context from the
SGSN the SRNC may decide on implementation specific reasons

10   to provide the MBMS UE context to DRNC in good time before
the session starts. The SRNC includes the Session Id and the
S-RNTI in RNSAP MBMS Attach Request. By reception of the
RNSAP UE linking message the DRNC creates the MBMS UE
context and in case no MBMS Service context exists for the

15   MBMS service the DRNC registers in SGSN. This will only
happen for the first UE that is linked over Iur and there is
no other UE MBMS context for the corresponding MBMS service
established in the DRNC. The sole purpose of the RAN
Registration is to receive the start message. It is quite

20   obvious in this scenario that there will be frequent Iur-
linking will due to mobility in RAN before session and as a
consequence also a increased frequency of RNC registrations.

Late Iur-linking: Mobiles in RRC Connected are linked over
Iur at reception of session start. By reception of the

25   Session Start message which includes the session id for the
MBMS service, which is to start. The SRNC checks the MBMS
service context stored in SRNC, which contains a list of RRC
Connected mobiles and MBMS Service ids for activated MBMS
services. The SRNC then includes the Session ID and the S-

30   RNTI in RNSAP MBMS Attach Request and sends the message to
each DRNC. In case there is no MBMS Service context
established the DRNC sends a RNC Registration message to its
default SGSN and then updates the MBMS Service context for

the DRNC in its role of CRNC to include Cell ID. It is quite obvious in this scenario that the RNC registration procedure is not needed and it may take considerable time to establish a procedure with a SGSN, which does not hold any MBMS Service for the session. This will typically happens when all mobiles are kept in PMM idle after joined or are in CS Connected. Instead the required session parameters for setting up the MBMS service is provided in the Iur-linking procedure. An indication is also provided in the Iur-linking to indicate that RNC Registration shall not be performed. It is obvious from this scenario that the Iur-linking signalling easily provides Start Session functionality to the DRNC over the Iur-interface. The gain is one less MBMS procedure to implement. The Iur-linking signalling may be optimised such that it may include a list of UEs to reduce the signalling processing in SRNC.

At session start the SRNC will therefore send one MBMS Attach Request message per DRNC. This may cause additional signalling load processing both in SRNC and in DRNC, which eventually cause overload problem. To reduce an overload situation the SRNC may decide to spread the load in time by Iu-linking in time before the session starts, but this is seen as an implementation issue.

The optimised approach provides following functionalities:

- Before session starts it is optional for the SRNC to initiate Iur-linking at reception of RANAP MBMS UE Linking Request.

- During session it is mandated for the SRNC to initiate Iur-linking at reception of RANAP MBMS UE Linking Request.

- For Late Iur-linking it is mandated at reception of RANAP MBMS Session start the SRNC to initiate Iur linking according to the list of PMM Connected mobiles associated with MBMS service Id for the session.

5   • For DRNC it is mandated to receive and act on RNSAP MBMS Attach Request whenever received before, at session start and during a MBMS transmission.

The following now explains further details on Iur-linking procedure in DRNC and RNC Registration procedure. By
10   reception of multiple Iur-linking messages over Iur the DRNC, in its role of CRNC, will add number UEs per cell, both own UEs for which the RNC is a serving RNC and for which the RNC is a drift RNC.

Based RRM considerations (local O&M) and on these figures at
15   session start, the CRNC decides on ptm/ptp on a cell basis. In case of ptm the Iu MBMS bearer is configured and set up over Iu by the DRNC based on the stored MBMS service context. In case of ptp the Iu MBMS bearer is configured and set up by the SRNC.

20   In case of not enough number of mobiles for a decision the CRNC may decide to page the idle mobiles (RRC Idle, URA_PCH) to count them in RRC Connected state.

The DRNC/CRNC shall inform SRNC of its decision for each cell where there are MBMS mobiles. The channel type
25   (ptp/ptm) decision by CRNC is signalled to each SRNC to which the DRNC has a DRNC-SRNC relation. This information is needed by the SRNC to configure its Iu MBMS bearer, e.g. to release not needed Iu MBMS bearer due absence of MBMS mobiles in case of ptm, to set up an Iu MBMS bearer in case
30   of ptp.

The ptp/ptm decision and resource configuration/re-configuration is on cell level. In case the MBMS service is delivered over ptm, the CRNC shall indicate its decision to SRNC by sending a list of U-RNTI(s) or a list of Cell ids

5   together with the channel type, where the MBMS stream is delivered on a shared transport channel. In case the MBMS is delivered over a dedicated transport channel (ptp) for the UE the CRNC indicates its decision by sending a list of U-RNTI(s) together with the channel type.

10   In case of Early Iur-linking and ptp decision the DRNC sends RNSAP MBMS ptm Transmission Initiation including a list of U-RNTIs and MBMS Service Id.

In case of Early Iur-linking and ptm decision the DRNC sends RNSAP MBMS ptm Transmission Initiation including a list of

15   Cell-Ids and MBMS Service Id.

In case of Late Iur-linking and ptp decision the DRNC sends RNSAP MBMS ptm Transmission Initiation including a list of U-RNTIs and/or sends the ptm/ptp decision indicator in RNSAP MBMS Attach Response message. The MBMS Service Id is

20   included.

In case of Late Iur-linking and ptm decision the DRNC sends RNSAP MBMS ptm Transmission Initiation including a list of Cell-Ids and/or sends the ptm/ptp decision indicator in the Iur-linking respond message. The MBMS Service ID is

25   included.

The decision on ptp/ptm can be done at any point in time, i.e. from the moment when the first UE is linked to MBMS Service Context in CRNC up to the time when the session starts. However for the multi-cast scenario it is assumed

30   that ptp/ptm decision shall be done close to session start.

In case of Early Iur-linking and early decision on ptp/ptm the DRNC may decide on ptp/ptm long before session starts. In this case the DRNC may decide to indicate its decision early to the SRNC.

5   The registration can be inhibit such that the DRNC will only register to the PS CN in case the number of UEs is above a threshold which motivate at least one ptm MBMS radio bearer to be set up in the DRNC for the MBMS service. The reason for this is that CRNC/DRNC may regard the registration as a

10   request for Iu bearer to be set up for one or several cells in the RNC for MBMS transmission on a shared radio bearer resource. Care must be taken to know the timing when to send the RANAP Registration Indication. If it is sent to early the situation may be at session start (by reception of RANAP

15   Start Indication) that the number of UEs has fallen below the threshold. If it is sent to late the PS CN will not be able to send the Start Indication (Pure DRNC case) in time for the session. For the ptp case the MBMS transmission path only includes the SRNC Iu bearer.

20   The conclusion is that RNC registration is feasible in case of ptm decision and the RNC registration may be linked to ptm/ptp decision rather than to register to the default SGSN when the first UE is linked by the DRNC.

For the ptp case there is no need to register to the CN in

25   case of Late Iur-linking. For the ptm case and Late Iur-linking it is feasible to register to the CN.

In case of Early Iur-linking the explicit registration is required but has potential impacts on CN and RAN due to unnecessary registration/deregistration to the CN due to

30   mobility in RAN before session starts.

CLAIMS

1. A method in a Radio Network Controller (RNC) acting as a
Drift RNC (DRNC) for one or more user equipments in a
5   communication   system   supporting   Multimedia   Broadcast
Multicast Service (MBMS), whereby said user equipments
intend to register for an MBMS-session,

c h a r a c t e r i s e d   b y

defining a counter and a first threshold value for gathering
10   a number of user equipments that intend to register for an
MBMS-session,

delaying registration of said gathered user equipments
towards the core network until said counter has exceeded
said threshold value.

15   2. The method according to claim 1, whereby said counter
counts the number of user equipments and said first
threshold value corresponds to a maximum number of user
equipments.

3. The method according to claim 1, whereby said counter
20   counts a pre-determined period of time and said first
threshold value corresponds to the maximum time value.

4. The method according to one of the preceding claims
further comprising the steps of

defining a second threshold value,

25   delaying a deregistration of said Drift RNC until said
counter has a value below said second threshold value.

5. The method according to claim 4, whereby the second
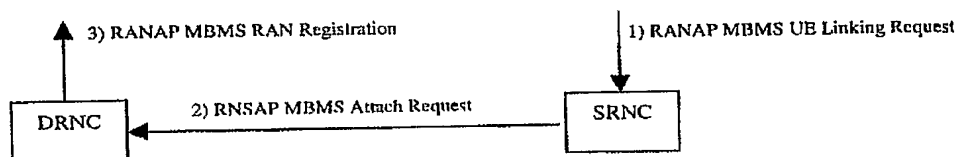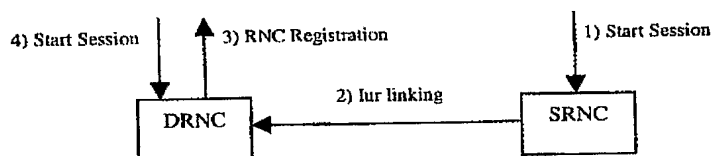threshold value invokes a hysteresis.

1/1

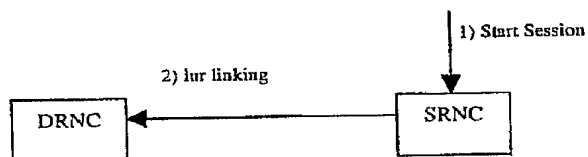3) RANAP MBMS RAN Registration

1) RANAP MBMS UB Linking Request

DRNC   2) RNSAP MBMS Attach Request   SRNC

Fig. 1

4) Start Session   3) RNC Registration

1) Start Session

DRNC   2) Iur linking   SRNC

Fig. 2

1) Start Session

2) Iur linking

DRNC   SRNC

Fig. 3